CLAIMS

What is claimed is:

1. A method of managing nodes in a point-to-point network, said point-to-point network connected to a shared medium network by at least one network access point, comprising:

forming an administrative domain based on said point-to-point network and said shared medium network;

defining a network access point service area (NAPSA) for said network access point; and

broadcasting a beacon message from said network access point at regular intervals throughout said NAPSA to provide said nodes with information about said network access point, including any changes in a route from said nodes to said network access point.

2. The method according to claim 1, wherein said network access point is an administrative domain attachment point (ADAP) through which said nodes of said point-to-point network are connected to said shared medium network, further comprising identifying said administrative domain by a unique administrative domain identification (ADI), and identifying said ADAP by a MAC address of said network access point such that ADAPs that are connected to the same shared medium network have the same ADI, but different MAC addresses, and all nodes with the same ADI and the same ADAP are members of the same NAPSA.

3. The method according to claim 2, further comprising defining broadcast types, including: a first broadcast type covering a single NAPSA, a second broadcast type covering a single point-to-point network, a third broadcast type covering a single administrative domain, and a fourth broadcast type covering a single point-to-point network and a single administrative domain.

4. The method according to claim 3, further comprising allowing data packets having said first broadcast type to be exchanged between nodes having the same ADI and ADAP, and blocking said data packets from being exchanged between nodes having the same ADI, but different ADAPs.

5. The method according to claim 3, further comprising blocking data packets having said third broadcast type and data packets carrying higher layer protocol messages from being exchanged between nodes having different ADIs.

6. The method according to claim 3, wherein said ADAP is configured to broadcast a beacon message throughout said NAPSA at regular intervals to provide said nodes with information about said ADAP, including any changes in a route from said nodes to said ADAP.

7. The method according to claim 6, further comprising accumulating a hop count in said beacon message for a route traversed by said beacon message, receiving said beacon message at said nodes, and updating a route entry of said ADAP in said

nodes if said accumulated hop count in said beacon message is different from a hop count of said route entry of said ADAP.

8. The method according to claim 7, further comprising removing said route entry of said ADAP from said nodes and disconnecting said nodes from said NAPSA when two or more consecutive beacon messages have been detected as missing.

9. The method according to claim 8, further comprising sending a discovery message from a node throughout said NAPSA when said ADAP has been detected by said node as unreachable or a connection to said NAPSA has been detected by said node as disconnected.

10. The method according to claim 9, wherein said discovery message is sent in a data packet having said first broadcast type.

11. The method according to claim 9, further comprising immediately sending a beacon message from said ADAP upon receiving said discovery message from said node.

12. The method according to claim 11, further comprising setting a flag in all nodes in said NAPSA receiving said discovery message to indicate to said nodes that an extra beacon message may be received.

13. The method according to claim 9, further comprising sending a route error message from said detecting node to affected neighbor nodes in addition to sending said discovery message.

14. The method according to claim 9, further comprising sending a neighbor information message to a second node located outside said NAPSA from a first node that is a neighbor node of said second node when a change in said NAPSA is detected by said first node, said first node located within said NAPSA near a border of said NAPSA.

15. The method according to claim 14, wherein said change in said NAPSA includes a change in at least one of said ADI, said ADAP, and a hop count for a route between said first node and said ADAP.

16. The method according to claim 15, wherein said change in said NAPSA is due to said first node detecting that it can no longer communicate with said ADAP.

17. The method according to claim 16, further comprising sending an acknowledgement neighbor information message from said second node to said first node to acknowledge receipt of said neighbor information message.

18. The method according to claim 17, wherein said neighbor information message contains information about said NAPSA including at least said ADI, said

ADAP and said hop count for a route between said first node and said ADAP, further comprising storing said information in a table in said second node.

19. The method according to claim 18, further comprising determining whether to switch a NAPSA of said second node, if any, to said NAPSA of said first node based on said information about said NAPSA.

20. The method according to claim 17, wherein said neighbor information message and said acknowledgement neighbor information message are also exchanged between two nodes when a connection between said two nodes is initially created to allow said two nodes to select a NAPSA.

21. The method according to claim 20, further comprising determining whether said connection between said two nodes is one that crosses an administrative domain border, a NAPSA border, or no border based on said neighbor information messages.

22. The method according to claim 20, further comprising determining whether any one of said two nodes lists an ADI therein.

23. The method according to claim 22, further comprising connecting none of said two nodes to a NAPSA if no nodes list an ADI, and allowing all data packets to be exchanged between said nodes.

24. The method according to claim 22, wherein one of said two nodes lists an ADI and another one of said two nodes does not, further comprising connecting said node that does not list an ADI to an administrative domain of said node that does list an ADI, and allowing all data packets to be exchanged between said two nodes.

25. The method according to claim 22, wherein both of said two nodes list the same ADI, but different ADAPs and a hop count difference of one or zero hops, further comprising keeping said two nodes connected to their current NAPSA, if any, and blocking broadcast data packets having said first broadcast type or said third broadcast type from being exchanged between said two nodes.

26. The method according to claim 22, wherein both of said two nodes list the same ADI, but different ADAPs and a hop count difference larger than one hop, further comprising switching one of said two nodes that lists the highest hop count to a NAPSA of the other one of said two nodes that lists the lowest hop count to achieve the lowest hop count between said two nodes and an ADAP.

27. The method according to claim 22, wherein said two nodes list the same ADI and ADAP and a hop count difference of one or zero hops, further comprising allowing all data packets to be exchanged between said two nodes.

28. The method according to claim 22, wherein said two nodes list the same ADI and ADAP and a hop count difference that is greater than one hop, further comprising setting a next hop node of a route entry for said ADAP in one of said two

nodes having a higher hop count to indicate the other one of said two nodes having a lower hop count, changing a hop count in said route entry for said ADAP in said node having a higher hop count to a hop count of said node having a lower hop count plus one, and allowing all data packets to be exchanged between said two nodes.

29. The method according to claim 22, wherein said two nodes list a different ADI, further comprising blocking all data packets carrying data belonging to protocol layers higher than a protocol layer to which said neighbor information message belongs from being exchanged between said two nodes.

30. The method according to claim 19, wherein determining whether to switch NAPSAs includes comparing, in said second node, said information about said NAPSA received in said neighbor information message with information previously stored in said second node, and connecting said second node to said NAPSA of said first node if a hop count contained in said neighbor information message is more than one hop lower than a hop count stored in said second node.

31. The method according to claim 30, further comprising sending a registration message from said second node to an ADAP of said NAPSA of said first node, said registration message including a MAC address of said second node, when said second node has decided to connect to said NAPSA of said first node.

32. The method according to claim 31, further comprising sending an acknowledgement message from said ADAP to said second node to acknowledge receipt of said registration message by said ADAP.

33. The method according to claim 32, further comprising sending an information message from said ADAP to other ADAPs connected to said shared medium network to inform said other ADAPs that said second node is now connected to said ADAP.

34. The method according to claim 33, further comprising determining whether to switch NAPSA for said first node upon receiving said acknowledgement neighbor information message from said second node, said determination similar to a determination performed by said second node.

35. A system for managing one or more nodes of a point-to-point network, comprising:

at least one network access point connecting said nodes of said point-to-point network to said shared medium network;

said nodes configured to form an administrative domain based on said point-to-point network and said shared medium network and define a network access point service area (NAPSA) for said network access point; and

said network access point configured to broadcast a beacon message from said network access point at regular intervals throughout said NAPSA to provide said nodes with information about said network access point, including any changes in a route from said nodes to said network access point.

36. The system according to claim 35, wherein said network access point is an administrative domain attachment point (ADAP) through which said nodes of said point-to-point network are connected to said shared medium network, and wherein said administrative domain is identified by a unique administrative domain identification (ADI), and said ADAP is identified by a MAC address of said network access point such that ADAPs that are connected to the same shared medium network have the same ADI, but different MAC addresses, and all nodes with the same ADI and the same ADAP are members of the same NAPSA.

37. The system according to claim 36, wherein said nodes of said point-to-point network are further configured to define broadcast types for data packets used in said point-to-point network, including: a first broadcast type covering a single

NAPSA, a second broadcast type covering a single point-to-point network, a third broadcast type covering a single administrative domain, and a fourth broadcast type covering a single point-to-point network and a single administrative domain.

38. The system according to claim 37, wherein data packets having said first broadcast type are allowed to be exchanged between nodes having the same ADI and ADAP, and data packets having the same ADI, but different ADAPs, are blocked from being exchanged between nodes having the same ADI and ADAP.

39. The system according to claim 37, wherein data packets having said third broadcast type and data packets carry higher layer protocol messages are blocked from being exchanged between nodes having different ADIs.

40. The system according to claim 37, wherein said ADAP is configured to broadcast a beacon message throughout said NAPSA at regular intervals to provide said nodes with information about said ADAP, including any changes in a route from said nodes to said ADAP.

41. The system according to claim 40, wherein said beacon message includes an accumulated hop count for a route traversed by said beacon message, said nodes in said point-to-point network configured to receive said beacon message and update a route entry for said ADAP in said nodes if said accumulated hop count in said beacon message is different from a hop count of said route entry of said ADAP.

42. The system according to claim 41, wherein said nodes in said point-to-point network are further configured to remove said route entry for said ADAP and disconnect from said NAPSA when two or more consecutive beacon messages have been detected as missing.

43. The system according to claim 42, wherein each node in said point-to-point network is configured to send a discovery message throughout its respective NAPSA when said ADAP thereof has been detected by said node as unreachable or a connection to said NAPSA has been detected by said node as disconnected.

44. The system according to claim 43, wherein said discovery message is sent in a data packet having said first broadcast type.

45. The system according to claim 43, wherein said ADAP is further configured to immediately send a beacon message upon receiving said discovery message from said node.

46. The system according to claim 45, wherein each node receiving said discovery message in said NAPSA is configured to set a flag therein to indicate that an extra beacon message may be received.

47. The system according to claim 43, wherein any node in said point-to-point network detecting a route failure is configured to send a route error message to affected neighbor nodes in addition to sending said discovery message.

48. The system according to claim 43, wherein said point-to-point network includes a first node and a second node, said first node located within a NAPSA near a border thereof and said second node located outside said NAPSA of said first node, said first node configured to send a neighbor information message to said second node when a change in said NAPSA is detected by said first node.

49. The system according to claim 48, wherein said change in said NAPSA includes a change in at least one of said ADI, said ADAP, and a hop count for a route between said first node and said ADAP.

50. The system according to claim 49, wherein said change in said NAPSA is due to said first node detecting that it can no longer communicate with said ADAP.

51. The system according to claim 50, wherein said second node is configured to send an acknowledgement neighbor information message to said first node to acknowledge receipt of said neighbor information message.

52. The system according to claim 51, wherein said neighbor information message contains information about said NAPSA including at least said ADI, said ADAP, and said hop count for a route between said first node and said ADAP, said second node further configured to store said information in a table in said second node.

53. The system according to claim 51, wherein said second node is further configured to determine whether to switch its NAPSA, if any, to said NAPSA of said first node based on said information about said NAPSA of said first node.

54. The system according to claim 52, where said neighbor information message and said acknowledgement neighbor information message are also exchanged between two nodes when a connection between said two nodes is initially created to allow said two nodes to select a NAPSA.

55. The system according to claim 54, wherein said two nodes are further configured to determine whether said connection between said two nodes is one that crosses an administrative domain border, a NAPSA border, or no border based on said neighbor information messages.

56. The system according to claim 54, wherein said two nodes are further configured to determine whether either one of said two nodes lists an ADI therein.

57. The system according to claim 56, wherein neither of said two nodes are connected to a NAPSA if both nodes do not lists an ADI, in which case all data packets are allowed to be exchanged between said two nodes.

58. The system according to claim 56, wherein one of said two nodes lists an ADI and the other one does not, said node that does not list an ADI is configured to

connect to an administrative domain of said node that does list an ADI, and all data packets are allowed to be exchanged between said two nodes.

59. The system according to claim 56, wherein both nodes lists the same ADI, but different ADAPs and a hop count difference of one or zero hops, said two nodes configured to stay connected to their current NAPSA, if any, and block broadcast data packets having said first broadcast type or said third broadcast type from being exchanged between said nodes.

60. The system according to claim 56, wherein both of said two nodes list the same ADI, but different ADAPs and a hop count difference larger than one hop, said two nodes configured to switch one of said two nodes that lists the highest hop count to a NAPSA of the other one of said two nodes that lists the lowest hop count to achieve the lowest hop count between said two nodes and an ADAP.

61. The system according to claim 56, wherein said two nodes list the same ADI and ADAP and a hop count difference of one or zero hops, said two nodes configured to allow all data packets to be exchanged between said nodes.

62. The system according to claim 56, wherein said two nodes list the same ADI and ADAP and a hop count difference that is greater than one hop, said two or more nodes configured to set a next hop node of a route entry for said ADAP in one of said two nodes having a higher hop count to indicate the other one of said two nodes having a lower hop count, change a hop count in said route entry for said ADAP in

said node having a higher hop count to a hop count of said node having a lower hop count plus one, and allow all data packets to be exchanged between said two nodes.

63. The system according to claim 56, wherein said two nodes list a different ADI, said two or more nodes configured to block all data packets carrying data belonging to protocol layers higher than a protocol layer to which said neighbor information message belongs from being exchanged between said two nodes.

64. The system according to claim 53, wherein said second node is configured to determine whether to switch NAPSAs by comparing said information about said NAPSA of said first node received in said neighbor information message with information previously stored in said second node, and connect said second node to said NAPSA of said first node if a hop count contained in said neighbor information message is more than one hop lower than a hop count stored in said second node.

65. The system according to claim 64, wherein said second node is further configured to send a registration message from said second node to an ADAP of said NAPSA of said first node, said registration message including a MAC address of said second node, when said second node has decided to connect to said NAPSA of said first node.

66. The system according to claim 65, wherein said ADAP is further configured to send an acknowledgement message to said second node to acknowledge receipt of said registration message by said ADAP.

67. The system according to claim 66, wherein said ADAP is further configured to send an information message to other ADAPs connected to said shared medium network to inform said other ADAPs that said second node is now connected to said ADAP.

68. The system according to claim 67, wherein said first node is configured to determine whether to switch NAPSA upon receiving said acknowledgement neighbor information message from said second node, said determination similar to a determination performed by said second node.